

INFORMED DECISIONS ON CATASTROPHE RISK

Failing to learn from experience about catastrophes

The case of hurricane preparedness

Anecdotal evidence suggests people have **short memories for catastrophic losses.**

- After Hurricane Katrina induced massive flooding in New Orleans in 2005, the National Flood Insurance Program witnessed a 53% nationwide increase in new flood policies issued the following year — only to watch new purchases drop back to pre-2005 levels — a 33% cancellation rate of existing policies — by 2008.

We conducted studies in which participants had a monetary incentive to learn from experience how to **best protect against losses** from hurricanes.

- We used computer simulations to study how individuals learn to make decisions about investing in hurricane preparedness.
- Participants made recurrent decisions about how much to invest in short-term protection against immediate threats, and in longer-term protection against future threats.
- Participants were paid based upon their final net worth in the game.

Results:

The primary motivator of decisions to invest in protection is the size of **experienced losses**— not losses that are avoided.

The **more effective** an investment is in preventing harm, the **more difficult** it is for decision makers to **remember the need** for the investments.

- Storm damage caused people to increase their investment in protection immediately after a storm, but investments were not sustained over time. Investments in protection increased during the first simulated hurricane season, but regressed at the start of the next.
- The data show a paradox of protection: the avoidance of losses due to protection suppressed subsequent investments, just as if the storm event never occurred.
- It was the experience of real — not imagined — losses that seemed essential for convincing decision makers of the value of protective investments.

Decisions of **whether to prepare** were driven mainly by the **proximity of the storm**.

- Similar to what has been observed in some real-world studies of hurricane preparedness, participants were quick to attend to the threat of hurricanes that posed even a slight threat to their locations.

Decisions of **how much to prepare** were driven by factors such as the **storm's strength**, and the **size of the loss experienced from the last two encountered storms**.

- As storms approached, participants' initial investments in protection were not followed up by further investments that would be adequate for the scale of the threat they faced.
- This under-investment was conditioned by recent experience; the greater (or weaker) the previous experienced storm losses, the greater (or weaker) the current investment in protection.

In our studies, **investment in protection was below optimal levels** for both short-term and long-term protection.

- There was a slight tendency to over-invest when encountering storms that did not call for protection.
- There was large and persistent under-investment when encountering storms that posed a real threat, ranging from 23% under-investment when limited protection was optimal to 44% under-investment when maximum protection was optimal.

Failure to Learn:

People learned to protect their homes, but with a **“two steps forward, one step back”** pattern.

- Investments in protection may be, paradoxically, self-extinguishing.
- The more successful a protective investment is in precluding harm, the more difficult it becomes to observe its benefits.
- In such cases, reinforcement relies on the ability of the decision maker to imagine what would have happened had the investment not been made.

Learning to make hurricane preparedness decisions

We undertook studies on the ability of individuals to learn via computer simulation how to make decisions about investing in preparedness for hurricane threats. Participants were told that they would be living for three years in a region that was prone to hurricane threats. Their goal was to make a series of decisions about how much to invest in protection against approaching storms so as to maximize their total net wealth at the end of each year, defined as the initial value of their home minus losses due to hurricane damage and investments in protection. The amount of damage caused by a storm depended on its strength and proximity. Potential losses could be mitigated by purchasing protection each time a storm approached. Purchased levels of protection remained in place only for the duration of a given storm; with each new storm, a new decision would need to be made about how much to invest in protection.

Hurricanes appeared as an animated storm icon on the screen. As the storm intensified, the color of the icon would change to reflect increasing intensity on a 0-to-4 scale, green (category 0) to black (category 4). Investment levels were presented as a choice between two categories: limited protection at a low cost, or complete protection at a high cost. Limited protection was implemented by clicking on a button labeled, "Board Up" on the screen; complete protection was implemented by clicking on a button labeled, "Evacuate." Repeated clicking of "Board Up" allowed participants to purchase up to 50 points of protection (of a possible 100) in 10-point blocks at a cost of \$100 per block. Clicking "Evacuate" increased their protection to 100 points at a cost of \$2,500. After each storm (whether it hit land or not) participants were taken to a "damage assessment" screen that revealed how much damage (in dollars) they suffered from the storm, plus the theoretical amount of damage they would have suffered had they not invested in protection.

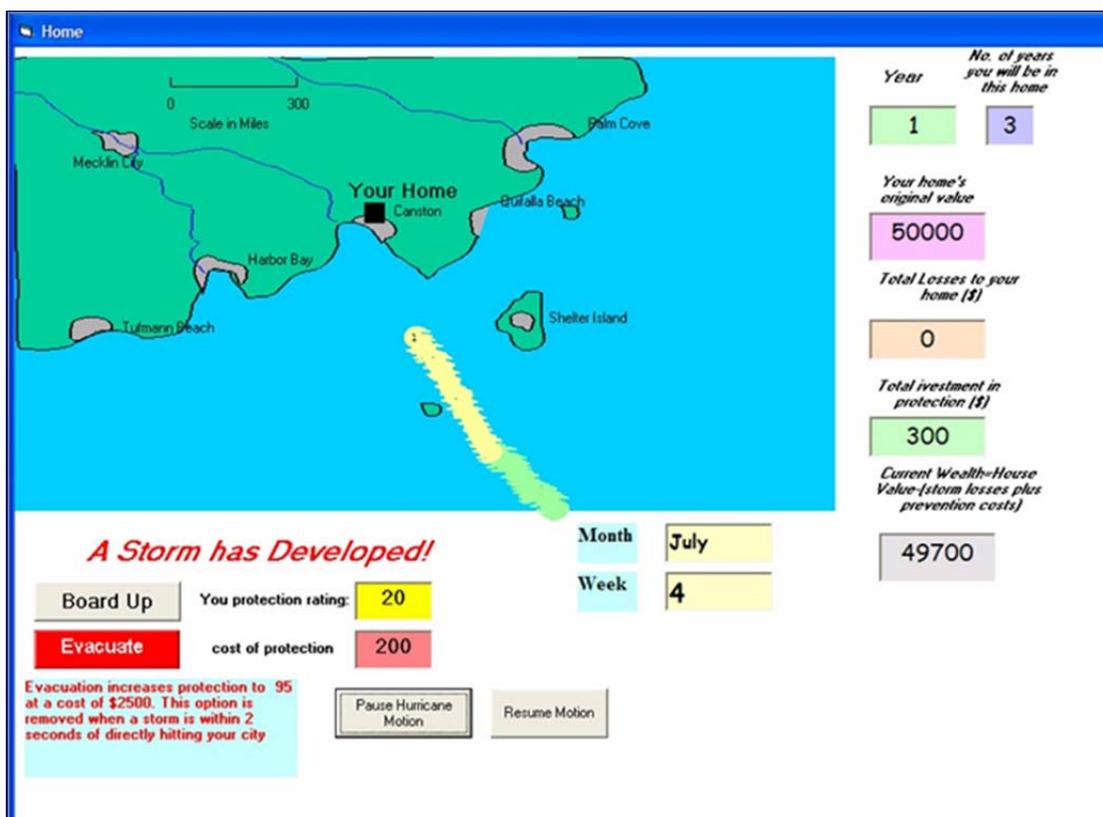


FIGURE 1. STORM MOTION AND MITIGATION DECISIONS

For more information, please access the full study or contact the author: meyerr@wharton.upenn.edu

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Robert Meyer (meyerr@wharton.upenn.edu) is the Gayfryd Steinberg Professor and Co-Director of Wharton's Risk Management and Decision Processes Center. He is a noted scholar whose research focuses on consumer decision analysis, sales response modeling, and decision making under uncertainty. Professor Meyer's work has appeared in a wide variety of professional journals and books, including the *Journal of Consumer Research*, the *Journal of Marketing Research*, *Marketing Science*, and *Management Science*.